



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/553,754	10/18/2005	Makoto Iida	125664	5979

25944 7590 03/30/2007
OLIFF & BERRIDGE, PLC
P.O. BOX 19928
ALEXANDRIA, VA 22320

EXAMINER

MALEKZADEH, SEYED MASOUD

ART UNIT	PAPER NUMBER
----------	--------------

1722

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	03/30/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary

Application No.

10/553,754

Applicant(s)

IIDA, MAKOTO

Examiner

SEYED MASOUD
MALEKZADEH

Art Unit

1722

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 18 October 2005.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 10-28 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 10-28 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 10/18/2005 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☒ Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date 10/18/2005.
- 4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____.
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: _____.

DETAILED ACTION

Specification

The abstract of the disclosure is objected to because abstract exceed 150 words. Correction is required. See MPEP § 608.01(b).

Information Disclosure Statement

An initialed and dated copy of Applicant's IDS form 1449 filed on 10/18/2005, is attached to the instant Office action.

Claim Rejections - 35 USC § 102

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 28 is rejected under 35 U.S.C. 102(b) as being unpatentable by lida et al (US 6,334,896)

Claim 28 is drawn to a product, which is obtained by the process and therefore will be treated as required via MPEP 2113 [R-1].

"[E]ven though product-by-process claims are limited by and defined by the process, determination of patentability is based on the product itself. The patentability of a product does not depend on its method of production. If the product in the product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product was made by a different process." (MPEP 2113[R-1])

lida et al ('896) teaches a silicon single crystal wafer produced from a silicon single crystal produced by the production method of the lida et al ('896) (See lines 54-55, column 3)

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 10-28 are rejected under 35 U.S.C. 103(a) as being unpatentable over lida et al (US 6,334,896) in view of Fujikawa et al. (US 5,685,907).

lida et al. ('896) teaches a method for producing a silicon single crystal, wherein, silicon single crystal is grown by the Czochralski method, the crystal is pulled with such conditions as present in a region defined by a boundary between a V-rich region and an N-region and a boundary between an N-region and an I-rich region in a defect distribution chart showing defect and F/G which F represents a pulling rate and G represents a temperature gradient at a solid-liquid interface (See abstract, lines 64-67, column 2, and lines 1-14, column 3). lida et al. ('896) further teaches the single crystal is pulled with controlling a value of F/G within the range of about $0.112 \text{ (mm}^2 / ^\circ\text{C} : \text{min)}$ to about $0.142 \text{ (mm}^2 / ^\circ\text{C} : \text{min)}$ which is comparable with a range of $0.000724 \times T_{Max} + 1.31 \text{ (mm}^2 / \text{K} \times \text{min)}$ to $-0.000724 \times T_{Max} + 1.38 \text{ (mm}^2 / \text{K} \times \text{min)}$ from the melting point of silicon to 1400°C . and time required for crystal temperature to pass through the temperature region of from 900°C . to 600°C . to be 700 minutes or shorter on a method for producing a silicon single crystal by the CZ method. (See lines 13-26, column 8)

Furthermore, lida et al. (896) teaches silicon material of high purity is melted in the crucible by heating to a temperature higher than the melting point (about 1420°C), which teaches the highest temperature (Tmax) at an interface between a crucible and a raw material melt and is less than 1560°C .

Moreover, lida et al. (896) teaches in order to establish the production conditions used for the production method, an annular solid-liquid interface heat insulating material

Art Unit: 1722

is provided around the periphery of the solid-liquid interface of the crystal, and an upper surrounding heat insulating material is provided thereon. This solid-liquid interface heat insulating material is provided so as to form a gap of 3-5 cm between its lower end and the surface of silicon melt. The upper surrounding heat insulating material may not be used depending on the conditions.

Further, Iida et al. (896) teaches a heat insulating material surrounds the outside of the heater. (See lines 17-31, column 9)

Also, Iida et al. ('896) teaches the for producing a silicon single crystal, wherein a silicon single crystal is grown by the Czochralski method, the crystal is pulled with such conditions as present in a region defined by a boundary between a V-rich region and an N-region and a boundary between an N-region and an I-rich region in a defect distribution chart which teaches the silicon single crystal is pulled as the single crystal.

Further, Iida et al. ('896) teaches the silicon single crystal produced by this method can have a diameter of 8-16 inches or larger which includes 200mm and more. (See lines 14-23, column 12).

However, Iida et al. (896) does not teach a defect region or a defect-free region is determined according to the highest temperature at an interface between crucible and a raw material melt (T_{max}) in the single crystal.

In the analogous art, Fujikawa et al (US 5,685,907) teaches a method of preparing single crystals of compounds such as ZnSe. (See abstract)

Fujikawa et al ('907) further discloses if a solidified single crystal is subjected to a large temperature gradient, it is likely that a transformation, which may be turned into a

Art Unit: 1722

defect happens as well as if the temperature in the single crystal region was held at 1400°C immediately below the melting point, thereby, it prevent formation of defects. (See lines 36-42, column 10). Therefore, it teaches defect region or a defect-free region is determined according to the T_{max} (°C) (See lines 35-42, column 10).

It would have obvious to one of ordinary skill in the art at the time of the invention was made to modify the method of Iida et al ('896) by determining the defect or defect-free region in the single crystal according to the T_{max} (Highest temperature at an interface between crucible and a raw material melt) in order to control the quality of single crystal.

Remarks

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Seyed Masoud Malekzadeh whose telephone number is 571-272-6215. The examiner can normally be reached on Monday – Friday at 8:30 am – 5:00 pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Yogendra N. Gupta can be reached on (571) 272-1316. The fax number for the organization where this application or proceeding is assigned is 571-272-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published application may be obtained from either Private PAIR or Public PAIR. Status information

Art Unit: 1722

for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

SMM



ROBERT KUNEMUND
PRIMARY EXAMINER